CLAIMS

What is claimed is

- 1) A barrier and Mid-IR optical window for a free space optical system comprising at least one frame member and at least one thin film, a first frame member forming a closed loop structure about a substantially open aperture further having a receiving bonding surface upon which a first thin film may be received and bonded whereby said first thin film is affixed to said first frame and extends over the open aperture to form a taught, substantially flat surface.
- 2) A barrier and Mid-IR optical window of claim 1, said first frame further comprises a mechanical coupling means whereby said frame may be coupled to an optics head enclosure housing, and

said thin film is a polymer type material comprising molecules in a stressed state whereby polymer molecules are subject to a relaxing force which tends to pull the film taught in a shrinking action.

- 3) A barrier and Mid-IR optical window of claim 2, said thin film is bonded to said frame by an adhesive compatible with frame material and polymer material.
- 4) A barrier and Mid-IR optical window of claim 2, bond is plastic weld heat bond whereby these elements are joined together in a melting and fusing process.
- 5) A barrier and Mid-IR optical window of claim 2, said polymer molecules are stretched from their relaxed state and exert a force on the thin film whereby the thin film tends to be pulled into a plane.
- 6) A barrier and Mid-IR optical window of claim 2, said mechanical coupling means is a thread set complementary with an enclosure housing thread set.

- 7) A barrier and Mid-IR optical window of claim 2, said mechanical coupling means is a frame shape and size which cooperates with a receiving cavity of an enclosure housing whereby changing a window is a matter of simple manipulation of parts.
- 8) A barrier and Mid-IR optical window of claim 1, said window is comprised of two frames and two thin film members separated spatially be a body member.
- 9) A barrier and Mid-IR optical window of claim 2, further comprises condensation control means in spatial proximity to said thin film whereby condensation on the thin film is reduced.
- 10) A barrier and Mid-IR optical window of claim 9, said condensation control means is a desiccant reservoir.
- 11) A barrier and Mid-IR optical window of claim 9, said condensation control means is a heating element.
- 12) A barrier and Mid-IR optical window of claim 9, condensation control means is a dehumidifier in an optics head enclosure housing.
- 13) A barrier and Mid-IR optical window of claim 2, thickness of thin film is odd integer number of quarter wavelengths of a system design wavelength.
 - 14) Methods of forming optical windows including:

 providing a thin film polymer material highly uniform in thickness, said
 polymer being comprised of molecules held in a stretched or linearized state;

 forming a closed loop frame of rigid material to provide a large area open
 aperture;

affixing said polymer material to said frame;

applying heat to said thin film polymer to encourage polymer molecules to return towards a relaxed state thereby pulling the material taught across said large area open aperture; and

removing heat and allowing said polymer material to set or freeze in a taught state thereby providing a highly uniform flat surface.

- 15) Methods of claim 14, where providing a thin film step includes providing a film of thickness which after application of heat shrinks to a thickness about an odd integer number of quarter wavelengths of a design pass wavelength.
- 16) Methods of claim 14, forming a closed loop frame includes forming a bonding surface in a plane of suitable area whereby a thin film may be affixed thereto in a secure bond.
- 17) Methods of claim 14, forming a closed loop frame includes forming a mechanical coupling integral with the frame whereby it may be coupled to a cooperating housing enclosure and is removable therefrom.
- 18) Methods of claim 14, said affixing step is applying an adhesive material between frame and thin film and allowing it to cure.
- 19) Methods of claim 14, said affixing step is a heat bonding step whereby the plastic material of the thin film is fused with the material from which forms the frame in a plastic weld.
- 20) Methods of claim 14, said providing a thin film is forming a film of calculated uniform thickness in view of shrinking properties whereby after heating step the material is odd integral of quarter wavelengths
- 21) Methods of claim 14, further comprising a process step to reduce provide a condensation reduction means.